

IN THE CLAIMS:

Please amend the claims as indicated below.

1. (Currently Amended) A method for determining coefficient values for  
5 a shortening impulse response filter (SIRF), said method comprising the steps of:

establishing at least one set of defining constraints that said SIRF filter  
must satisfy in a time domain;

establishing at least one set of defining constraints that said SIRF filter  
must satisfy in a frequency domain; and

10 determining an intersecting set of said at least one set of defining ~~said time~~  
~~domain~~ constraints that said SIRF filter must satisfy in the time domain and said at least  
one set of defining ~~said frequency domain~~ constraints that said SIRF filter must satisfy in  
the frequency domain by employing vector space projection methods.

15 2. (Currently Amended) The method according to claim 1, wherein said  
at least one set of defining constraints that said SIRF filter must satisfy in a the time  
~~frequency~~ domain define a filter having a linear phase response.

20 3. (Currently Amended) The method according to claim 1, wherein said  
at least one set of defining constraints that said SIRF filter must satisfy in a the frequency  
domain define a filter having a non-linear phase response.

25 4. (Currently Amended) The method according to claim 1, wherein the  
~~said~~ time domain constraints specify a shortening of a channel impulse response.

5. (Currently Amended) The method according to claim 1, wherein the  
~~said~~ frequency domain constraints include a frequency response for said SIRF filter that  
does not attenuate a received signal.

30 6. (Currently Amended) The method according to claim 1, wherein the  
~~said~~ frequency domain constraints include a pass-band for said SIRF filter.

7. (Currently Amended) The method according to claim 2, wherein said at least one set of defining said frequency domain constraints that the SIRF filter must satisfy in the frequency domain is defined as follows:

$$C_2 \equiv \left\{ \mathbf{h} \in R^N : 1 - \alpha \leq |H(\omega)| \leq 1 + \alpha \text{ for } \omega \in \Omega_p \right. \\ \left. \text{and } |H(\omega)| \leq \beta \text{ for } \omega \in \Omega_s \right\}.$$

5 where  $\mathbf{h}$  is the impulse response of length  $N$  of the SIRF filter that shortens the impulse response of a channel,  $\omega$  is a frequency,  $\alpha$  and  $\beta$  are error tolerance regions of frequency and time domain, respectively,  $H(\omega)$  is the impulse response in the frequency domain,  $R^N$  is the Hilbert space of dimension  $N$ ,  $\Omega_p$  is the pass-band and  $\Omega_s$  is the stop-band.

10 8. (Currently Amended) The method according to claim 3, wherein said at least one set of defining said frequency domain constraints that the SIRF filter must satisfy in the frequency domain is defined as follows:

$$C_3 \equiv \left\{ \mathbf{h} \in R^N : 1 - \alpha \leq A(\omega) \leq 1 + \alpha \right. \\ \left. \text{and } \Phi(\omega) = -\omega(N-1)/2 \text{ for } \omega \in \Omega_p. \right. \\ \left. |H(\omega)| \leq \beta \text{ for } \omega \in \Omega_s. \right\}.$$

15 where  $\mathbf{h}$  is the impulse response of length  $N$  of the SIRF filter that shortens the impulse response of a channel,  $\omega$  is a frequency,  $\alpha$  and  $\beta$  are error tolerance regions of frequency and time domain, respectively,  $H(\omega)$  is the impulse response in the frequency domain,  $R^N$  is the Hilbert space of dimension  $N$ ,  $\Omega_p$  is the pass-band,  $\Omega_s$  is the stop-band,  $A(\omega) = \sum_0^{N/2-1} 2h(n) \cos \left[ \left( n - \frac{N-1}{2} \right) \omega \right]$  and  $\Phi(\omega) = -\frac{N-1}{2} \omega$ , wherein  $\Phi(\omega)$  and  $A(\omega)$  are independent filter characteristics and wherein  $\Phi(\omega)$  is a linear phase and  $A(\omega)$  is an amplitude.

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9. (Cancelled)

10. (Currently Amended) The method according to claim 1 9, wherein said  
25 vector space projection method is iteratively applied to said at least one set of defining

~~said time domain~~ constraints that said SIRF filter must satisfy in the time domain and said at least one set of defining ~~said frequency domain~~ constraints that said SIRF filter must satisfy in the frequency domain until ~~said the~~ sets converge to a set of coefficients satisfying said time domain constraints and said frequency domain constraints.

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11. (Currently Amended) A shortening impulse response filter (SIRF), comprising:

a set of finite impulse response (FIR) coefficients satisfying at least one constraint in a time domain and at least one constraint in a frequency domain, wherein  
 10 said at least one time domain constraint is represented as at least one first set and wherein said at least one frequency domain constraint is represented as at least one second set, wherein said finite impulse response (FIR) coefficients are determined by an intersecting set of said at least one first set defining said time domain constraints and said at least one second set defining said frequency domain constraints, wherein said intersecting set is  
 15 determined by employing vector space projection methods.

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12. (Currently Amended) The SIRF according to claim 11, wherein said at least one first set defining constraints that said SIRF filter must satisfy in a time frequency domain define a filter having a linear phase response.

13. (Currently Amended) The SIRF according to claim 11, wherein said at least one second set defining constraints that said SIRF filter must satisfy in a frequency domain define a filter having a non-linear phase response.

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14. (Currently Amended) The SIRF according to claim 11, wherein the ~~said~~ time domain constraints specify a shortening of a channel impulse response.

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15. (Currently Amended) The SIRF according to claim 11, wherein the ~~said~~ frequency domain constraints include a frequency response for said SIRF filter that does not attenuate a received signal.

16. (Currently Amended) The SIRF according to claim 11, wherein the ~~said~~ frequency domain constraints include a pass-band for said SIRF filter.

17. (Cancelled)

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18. (Currently Amended) The SIRF according to claim 11 ~~17~~, wherein said vector space projection method is iteratively applied to said at least one first set defining said time domain constraints and said at least one second set defining said frequency domain constraints until the ~~said~~ sets converge to a set of coefficients  
10 satisfying said time domain constraints and said frequency domain constraints.

19. (Currently Amended) A system for determining coefficient values for a shortening impulse response filter (SIRF), said system comprising:

a memory that stores computer-readable code; and

15 a processor operatively coupled to said memory, said processor configured to implement said computer-readable code, said computer-readable code configured to:

establish at least one set of defining constraints that said SIRF filter must satisfy in a time domain;

20 establish at least one set of defining constraints that said SIRF filter must satisfy in a frequency domain; and

determine an intersecting set of said at least one set of defining ~~said time domain~~ constraints that said SIRF filter must satisfy in the time domain and said at least one set of defining ~~said frequency domain~~ constraints that said SIRF filter must satisfy in the frequency domain by employing vector space projection methods.

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20. (Currently Amended) The system according to claim 19, wherein said at least one set of defining constraints that said SIRF filter must satisfy in a the time ~~frequency~~ domain define a filter having a linear phase response.

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21. (Currently Amended) The system according to claim 19, wherein said at least one set of defining constraints that said SIRF filter must satisfy in a the frequency

domain define a filter having a non-linear phase response.

22. (Currently Amended) The system according to claim 19, wherein the said time domain constraints specify a shortening of a channel impulse response.

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23. (Currently Amended) The system according to claim 19, wherein the said frequency domain constraints include a frequency response for said SIRF filter that does not attenuate a received signal.

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24. (Currently Amended) The system according to claim 19, wherein the said frequency domain constraints include a pass-band for said SIRF filter.

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25. (Currently Amended) The system according to claim 20, wherein said at least one set of defining ~~said frequency domain~~ constraints that the SIRF filter must satisfy in the frequency domain is defined as follows:

$$C_2 \equiv \left\{ \begin{array}{l} \mathbf{h} \in R^N : 1 - \alpha \leq |H(\omega)| \leq 1 + \alpha \text{ for } \omega \in \Omega_p \\ \text{and } |H(\omega)| \leq \beta \text{ for } \omega \in \Omega_s \end{array} \right\}.$$

where  $\mathbf{h}$  is the impulse response of length  $N$  of the SIRF filter that shortens the impulse response of a channel,  $\omega$  is a frequency,  $\alpha$  and  $\beta$  are error tolerance regions of frequency and time domain, respectively,  $H(\omega)$  is the impulse response in the frequency domain,  $R^N$

20 is the Hilbert space of dimension  $N$ ,  $\Omega_p$  is the pass-band and  $\Omega_s$  is the stop-band.

26. (Currently Amended) The system according to claim 21, wherein said at least one set of defining said ~~frequency domain~~ constraints that the SIRF filter must satisfy in the frequency domain is defined as follows:

$$C_3 \equiv \left\{ \begin{array}{l} \mathbf{h} \in R^N : 1 - \alpha \leq A(\omega) \leq 1 + \alpha \\ \text{and } \Phi(\omega) = -\omega(N-1)/2 \text{ for } \omega \in \Omega_p \\ |H(\omega)| \leq \beta \text{ for } \omega \in \Omega_s \end{array} \right\}.$$

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where  $\mathbf{h}$  is the impulse response of length  $N$  of the SIRF filter that shortens the impulse response of a channel,  $\omega$  is a frequency,  $\alpha$  and  $\beta$  are error tolerance regions of frequency

and time domain, respectively,  $H(\omega)$  is the impulse response in the frequency domain,  $R^N$  is the Hilbert space of dimension  $N$ ,  $\Omega_p$  is the pass-band,  $\Omega_s$  is the stop-band,  $A(\omega) = \sum_0^{N/2-1} 2h(n) \cos\left[\left(n - \frac{N-1}{2}\right)\omega\right]$  and  $\Phi(\omega) = -\frac{N-1}{2}\omega$ , wherein  $\Phi(\omega)$  and  $A(\omega)$  are independent filter characteristics and wherein  $\Phi(\omega)$  is a linear phase and  $A(\omega)$  is an amplitude.

27. (Cancelled)

28. (Currently Amended) The system according to claim 19 27, wherein  
 10 said vector space projection method is iteratively applied to said at least one set of  
 defining ~~said time domain~~ constraints that said SIRF filter must satisfy in the time  
domain and said at least one set of defining ~~said frequency domain~~ constraints that said  
SIRF filter must satisfy in the frequency domain until ~~said~~ the set of defining constraints  
that said SIRF filter must satisfy in the time domain sets converge to a set of coefficients  
 15 satisfying said time domain constraints and the set of defining ~~said frequency domain~~  
constraints that said SIRF filter must satisfy in the frequency domain converge to a set of  
coefficients satisfying said frequency domain constraints.